

REMARKS

Claims 1-19, 21-27, and 30-35 are currently pending in the above-identified application. Claims 1-8, 12-29 and 37-40, 42 and 43 have been rejected, claims 21-27 and 30-35 have been allowed, and claims 9-11 have been objected to. Claims 1, 2 and 8-11 have been amended and claims 37-40, 42 and 43 have been canceled without prejudice or disclaimer to the subject matter recited therein and solely for the purpose of furthering the prosecution of the above-identified application. Applicants respectfully request reconsideration in light of the foregoing amendments and following remarks.

The Office action indicates that the “front face of the application shows that an IDS was entered on February 26, 2003” and has requested the applicants’ assistance in obtaining the IDS. Applicants state that no IDS was filed on February 26, 2003, but instead a Submission of Formal Drawings was filed on that date.

Claims 1-6, 8, 12, 16, 18, 19, 37, 40, 42 and 43 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Chao et al. Claim 1 has been amended. Claims 37, 40, 42 and 43 have been canceled, thus rendering the rejection moot as to those claims.

Chao et al. discloses a method of making a phase-shift photomask. As noted in the Office action, Chao et al. discloses with reference to FIGS. 3A-3H a transparent layer 21, a light-transmissive film 24 overlying the layer 21, and a light-blocking film 25 overlying the film 24. Further, Chao et al. discloses a resist layer 26 used in the formation of openings amid a light-blocking film section 22 (the remainder of the light-blocking film 25). A polysilicon layer 28 is formed over the entire wafer, including within the openings.

An anisotropic etch is used to expose the top surface of the remaining light-blocking film section 22 and the light-transmissive film 24.

Chao et al. fails to teach or suggest “said opaque material layer having at least one opening therein filled with a first resist material” as recited in claim 1. The resist layer 26 of Chao et al. is used to form the openings within the opaque layer, but does not fill the openings, and the polysilicon layer 28 is not a resist material. Further, the resist layer 26 of Chao et al. does not define “areas of said first layer of material which are to be removed” and is not used “as a mask to remove said areas of said first layer of material”.

Claims 19, 37, 40, 42 and 43 stand rejected under 35 U.S.C. §102 as being unpatentable over DeMarco et al. Claims 37, 40, 42 and 43 have been canceled, thus rendering the rejection moot as to those claims. Claim 19 depends from claim 1.

DeMarco et al. discloses a mask formed with a transparent substrate 10, a patterned layer of chromium oxynitride formed in four regions 11-14, each region covered by a photoresist layer 15. DeMarco et al. describes the regions 11-14 as being partially transparent. Thus, DeMarco et al. either fails to teach or suggest “an opaque layer” or “a first layer of material over a substrate” as recited in claim 1.

Claims 13-15, 17, 38 and 39 stand rejected under 35 U.S.C. §103 as being unpatentable over Chao et al. in view of Kim. Claims 38 and 39 have been canceled, thus rendering the rejection moot as to those claims. Claims 13-15 and 17 ultimately depend from claim 1.

Kim is relied upon as teaching that phase shift masks can be effectively applied to line-space pattern formation and contact pattern formation and that phase shift masks use

molybdenum silicide and chromium fluoride as phase shifting material and quartz as a substrate material. Chao et al. and Kim fail to teach or suggest “said opaque material layer having at least one opening therein filled with a first resist material” as recited in claim 1.

Claims 38 and 39 stand rejected under 35 U.S.C. §103 as being unpatentable over DeMarco et al. in view of Kim. Claims 38 and 39 have been canceled, thus rendering the rejection moot.

Claims 7 and 17 stand rejected under 35 U.S.C. §103 as being unpatentable over Chao et al. in view of Adair et al. Claims 7 and 17 ultimately depend from claim 1.

Adair et al. is relied upon as teaching a phase shifting mask that includes both rim type and Levenson type phase-shifting and also teaching a quartz substrate. Chao et al. and Adair et al. fail to teach or suggest “said opaque material layer having at least one opening therein filled with a first resist material” as recited in claim 1.

Claims 9-11 stand objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base and any intervening claims. Applicants submit that, for at least the reasons provided above, claims 9-11, which depend from claim 1, are patentable over the cited references.

For at least the reasons advanced above, each of the presently pending claims is in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

Claims 1, 2 and 9-11 have been rewritten and claims 37-40, 42 and 43 have been canceled.

1. (Amended) A method of forming a mask, comprising:

forming a first layer of material over a substrate;

forming an opaque layer overlying said first layer of material, said opaque [material] layer having at least one opening therein filled with a [second] first resist material, said [second] first resist material residing over said first layer of material and defining areas of said first layer of material which are to be removed;

using said [second] first resist material as a mask to remove said areas of said first layer of material; and

removing said [second] first resist material.

2. (Amended) The method of claim 1, wherein the using of said [second] first resist material as a mask comprises providing a first region from which said first layer of material is removed, and the removing of said [second] first resist material comprises providing a second region from which said [second] first resist material is removed, said first and second regions having different phase shift characteristics with respect to light transmitted therethrough.

8. (Amended) The method of claim 1, wherein the forming of said opaque layer comprises:

- depositing a [first] second resist material on said opaque layer;
- removing a portion of said [first] second resist material, leaving said opening;
- etching an uncovered portion of said opaque layer underlying the removed portion of said [first] second resist material, thereby deepening said opening; and
- removing the remainder of said [first] second resist material.

9. (Amended) The method of claim 8, wherein the using of said [second] first resist as a mask comprises:

- providing said [second] first resist material within said opening and over said opaque layer;

- directing a first exposure through said substrate to expose a portion of said [second] first resist material;

- hardening the exposed portion of said [second] first resist material;

- directing a second exposure at said [second] first resist material to remove any unhardened portions of said [second] first resist material;

- providing a [third] second material over said opaque layer and said hardened portion of said [second] first resist material;

- performing a lithographic step on a portion of said [third] second material overlying and bounded by said [second] first resist material to expose and remove said

portion of said [third] second material; and

etching said first layer of material underlying said exposed and removed
portion of said [third] second material.

10. (Amended) The method of claim 9, wherein said [second] first resist material
is a positive-tone resist material capable of making an image reverse tone.

11. (Amended) The method of claim 9, wherein the exposed portion of said
[second] first resist material is hardened by baking.

Cancel claims 37-40, 42 and 43.